

18.

Field Notes on the Lizards
of Kartabo, British Guiana, and Caripito, Venezuela.Part 2. Iguanidae.¹

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(Plates I-VI; Text-figures 1-17).

[This contribution is a result of various expeditions of the Department of Tropical Research of the New York Zoological Society to British Guiana and to Venezuela, all made under the direction of Dr. William Beebe. The Guiana expeditions were made during the years 1909, 1916, 1917, 1919, 1920, 1921, 1922, 1924 and 1926, and the Venezuelan trips in 1908 and 1942. The latter was sponsored by grants from the Committee for Inter-American Artistic and Intellectual Relations and from four trustees of the Zoological Society, George C. Clark, Childs Frick, Laurance S. Rockefeller and Herbert L. Satterlee, and by invaluable assistance from the Standard Oil Companies of New Jersey and Venezuela.]

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INTRODUCTION.

This is a second paper on the lizards of Kartabo, British Guiana, and Caripito, Venezuela.² In the year 1909, and from 1916 to 1928, eight expeditions were sent out from this department to British Guiana, and in 1908 and again in 1942 field work was carried on in Venezuela.

Throughout the course of these expeditions many field notes, color plates and photographs were made of tropical vertebrates, and the object of this present series

is to assemble and publish some of these notes and illustrative material. Any change or alteration of the original notes is placed between brackets. The chief value of these data is that they are concerned with living or freshly killed specimens.

The observations in Guiana were made in one-quarter of a square mile of jungle at Kartabo, and those in Venezuela at or close to Caripito, which is only 528 kilometers northwest of Kartabo.

In addition to numerous technical papers in *Zoologica* and several popular volumes, there have been published the following general ecological summaries: *Zoologica*: (Kartabo) Vol. II, No. 7, 1919, pp. 205-227; Vol. VI, No. 1, 1925, pp. 1-193. (Caripito) Vol. XXVIII, No. 9, 1943, pp. 53-59. Also see "Tropical Wild Life in British Guiana" by Beebe, Hartley and Howes, published by the New York Zoological Society, 1917, pp. 1-504.

My hearty thanks go to Dr. Charles M. Bogert of the American Museum of Natural History and Dr. Karl P. Schmidt of the Chicago Natural History Museum for identifications and for bringing up to date my often out-worn names of many years ago.

My original field numbers and other data have been appended to descriptions, breeding and other notes. These specimens are either in the collections of the Department of Tropical Research or in those of the American Museum. Whenever the term total length is used, a perfect, unregenerated tail is understood. Many of the figures in the plates are black and white reproductions of original colored paintings, so only the pattern is preserved. The following are from paintings by Isabel Cooper, Plate-figures 1, 2, 3, 7, 9, 10, 17 and 18. Text-figures 3, 7, 11, 12 and 16. From drawings by George Swanson, Plate-figures 11 and 19. Text-figures 1, 4, 5, 8, 9, 13, 15 and 17. From photographs by T. V. Smolucha, Plate-figures 4, 5, 6, 8, 14, 15 and 16.

¹ Contribution No. 699, Department of Tropical Research, New York Zoological Society.

² Part 1, Gekkonidae, *Zoologica*, Vol. 29: pp. 145-160.

FAMILY IGUANIDAE.

Ecology of the Genera: Seven genera and fifteen species of this family of lizards were found at Kartabo, British Guiana, only four of which were recorded from Caripito, Venezuela. A longer period of field work at the latter locality would doubtless reveal many of the others. Eight of the fifteen species belong to the genus *Anolis*, which is not surprising when we recall that about one hundred species of these little lizards range from North Carolina to Brazil. Only two other *Anolis*, *lentiginosus* and *longicrus*, have been recorded from "The Guianas," neither of which we encountered. The *Iguana* we found is the only species of its genus, ranging in several subspecies over Central America, the West Indies and the northern half of South America. *Plica* is represented by two out of the four known species, the two remaining forms inhabiting Bolivia and Argentina respectively. *Polychrus* is present in one out of the two species of the genus. A single species of *Tropidurus* was found out of the twenty-odd known from elsewhere. *Uranoscodon* is a monospecific genus, confined to north-eastern South America. Out of six known species, one species of *Urocentron* was collected. This had hitherto been recorded only from Brazil.

Occurrence: In order of relative numbers as observed by us, we have: abundant, *Anolis*; common, *Iguana*, *Plica* and *Polychrus*; occasional, *Uranoscodon*; rare, *Tropidurus* (4) and *Urocentron* (2).

Size: From small to large; *Urocentron* (average 100 mm.), *Tropidurus* (150 mm.), *Anolis* (175 mm.), *Plica* (310 mm.), *Uranoscodon* (360 mm.), *Polychrus* (450 mm.), and *Iguana* (up to 1200 mm.).

Food: *Iguana* appears to be strictly vegetarian, but all the other lizards feed on insects and other invertebrates. Hints of cannibalism are observed rarely, and a small but definite amount of vegetable matter is taken by *Polychrus*.

Eggs: The number of eggs recorded is as follows: *Anolis* 2 (which may be deposited simultaneously or a week apart); *Plica* 2; *Iguana* 4 to 7; *Polychrus* 7 to 8; *Uranoscodon* 6 to 11.

Habitat: All fifteen species, with the exception of *Urocentron*, are essentially arboreal. *Anolis* and *Iguana* are found occasionally on the jungle floor, and the latter breeds in subterranean burrows. Among anolids fairly distinct haunts may be differentiated. *Anolis aeneus* and *fusco-auratus* are at home on low and rather small tree trunks, the latter preferring those with pale, lichen-covered bark. *Anolis biporcatus*, *chrysolepis* and *nitens* by preference choose the foliage of low jungle growths, and *Anolis punctatus* is found usually on the ground.

Escape Methods: Even the smallest anolids, when once seized, will bite ferociously but futilely, as their teeth are too minute to puncture human skin. The bite of a large iguana is very different, as the powerful muscles and sharp teeth can make an ugly wound.

All iguanid lizards, however, strive to escape observation by immobility, plus confusing postures and more or less swift change of pattern and coloring. *Anolis nitens* trusts so completely to its protective pattern that it can usually be picked up in the hand. *Plica* rests upsidedown on self-colored tree-trunks, and *Polychrus* assumes strained positions and holds them for hours, at the last moment rushing off headlong and again assuming a posture which allies it more to twigs and tendrils than to a living saurian. In *Uranoscodon* this trust is carried to an extreme, and not only can these lizards be picked from their perch on a tree, but carried home in what appears to be a trance-like condition. Once awakened from this, the phenomenon may reoccur from time to time in captivity. Iguanas feed usually high up in trees, and their favorite method of escape is to fling themselves headlong into water far beneath, or to flatten out and crash unharmed into thick foliage near the ground.

Competitors: As far as insect food is concerned, the only vertebrate competitors of the iguanid lizards are toads, brevicipitids and ant-thrushes on the ground, tree-frogs and low living jungle birds in low foliage. The tree-trunks are shared with dendrocaptine birds.

Enemies: Snakes are the source of greatest danger to these lizards, with jungle hawks a close second. Birds belonging to the genus *Attila* of the jungle cotingas feed extensively on small lizards, as do some of the terrestrial ant-thrushes. At Caripito, Mr. Swanson of my staff saw a good-sized jaguar in full pursuit of a large iguana, crossing the trail only a few yards away.

***Anolis aeneus* Gray, 1840.**

Name: Marbled Anolis.

Range: British Guiana, Venezuela, Trinidad and Tobago.

General Account: More than any other anolid, this species is semi-gregarious, occurring in limited areas of the jungle in relatively large numbers. I have found eleven in a space of ten square yards and no others anywhere nearby, although there was no apparent change of plant growth or of elevation. The marbled anolis is a tree-trunk lizard like *Plica*, rather than a frequenter of low, leafy bushes. I have seen and shot them at a height of thirty-five feet on the trunk of a mora.

In general, the head and neck are grayish. Body, limbs and tail buffy brown, indistinct-

ly mottled, banded and striped with darker. Beneath, head, throat, legs and terminal two-thirds of tail whitish; body and basal third of tail pale lemon yellow.

Two males displaying before females well up on the trunks of trees exhibited unusually extensive dewlaps. They began half way between the eye and tip of the snout and extended down the ventral surface half-way between the insertions of the fore and hind limbs. The vertical breadth was large in proportion.

There is no symmetry of dorsal markings, the pattern being of irregular blotches and reticulations, and I have noticed very little change in day and night alteration of color.

The tail is exceedingly deciduous and it is difficult to secure a perfect specimen. In two individuals shot from trees, the tail was freshly lost in one and semi-detached in the other, not from a shot injury. It is probable that this occurred from the shock of striking leaves or foliage in the fall of the anolis to the ground. I have never seen any hint of the lizard being able, by its own exertion, to discard its tail. Locally it is fairly common at Kartabo but I did not take it at Caripito. A blue-tinged individual was captured at the pitch lake at Guanoco, a few miles down river from Caripito.

In my journal I find references to detailed observations on this species but the notes themselves have disappeared.

Food: A specimen taken March 10, 1919, had its stomach filled with more than seventy-five mosquitoes, and another anolis had devoured fifteen termites.

***Anolis biporcatus* (Wiegmann, 1834).**

Name: Brown-backed Anolis.

Range: "Western Ecuador, northward into Central America," British Guiana.

General Account: Only two specimens were taken at Kartabo. Color Plate 1171 is of Specimen 204, a female, total length 160 mm., April 22, 1919. This individual is mottled with several shades of gray, and from the nape back to half-way down the tail extends a wide, vertebral band of light olive-buff. The dewlap of the second specimen, a male, when distended showed no heightened color, just a grayish-white expanse of skin. Both geckos were taken in one sweep of a butterfly net as they rested on the leaves of a low bush in the jungle.

These were identified by Dr. Noble; one specimen given to the American Museum, the other to the museum at Georgetown, British Guiana.

***Anolis chrysolepis* Dumeril and Bibron, 1837.**

(Plate I, Figs. 1 and 4).

Names: Vertebral-striped Anolis, Gold-striped Anolis, Large Jungle Anolis.

Range: Venezuela, Trinidad, the Guianas and Brazil.

General Account: This is the second in abundance of Kartabo and Caripito anolids, the first being *Anolis nitens*. Their favorite haunts are the leaves of low shrubs and bushes in the jungle and along the streams.

Female breeding, No. 2836, Kartabo, May 14, 1924, Color Plates 737, 738:

Measurements: Total length 136 mm. Following are percentages of length: Head 10.3 per cent., head and body 36, tail 64, head width 5, fore leg 13, hind leg 27, eye diameter 1.4 per cent. Weight 1.5 grams.

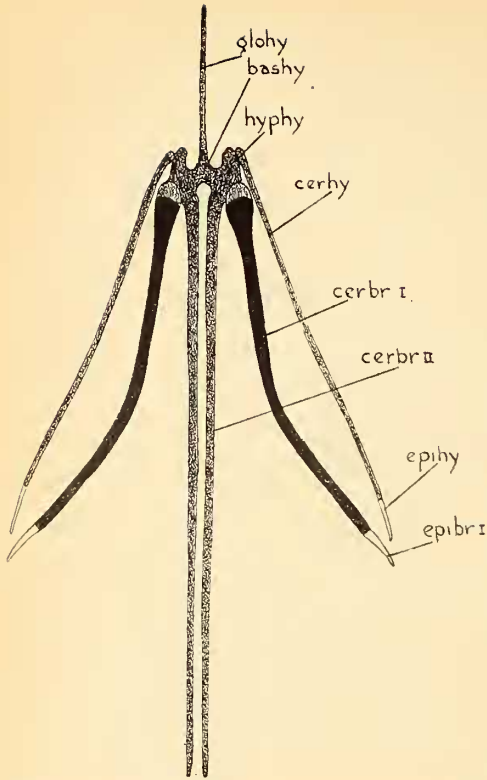
Color in Life: General color above olive with a strong greenish-yellow tinge. A double, broken, backward pointing, V-shaped, dark brown mark between the eyes. Starting the same distance from the pineal scale as its distance behind the point of the ocular V-mark is a broad dorsal stripe of yellow ochre, overlaid with two narrow stripes, one on each side of a light golden. There is a fine line of the yellow ochre outside of these gold stripes on each side, then a broad edging of very dark brown, black on the inner side and fraying out to an irregular scattering of sepia freckles. Sides of head and body and upper parts of limbs are faintly spotted with red brown. Laterally and along sides of neck and chin are strong mottlings of lavender which die out to purest white on the chin, small dewlap and ventral surface. This latter is immaculate except for scattered specks of very light brown posteriorly and for a dull brown tinge to the under surfaces of the limbs. Tail is faintly barred with narrow rings of brown, becoming mottled half way down and finally black on the last quarter inch. Pupil ring gold; iris orange with faint dark mottlings.

Male not breeding: Above brownish-black, with wide median stripe of burnt orange variegated with gray. A broad band across top of head between eyes. Below grayish-white, with scarlet dewlap. Iris dark brown with inner ring of gold.

Male not breeding: Back dark olive buff shading downward to wood brown and pinkish-white on ventral surface. Dorsal stripe pale vinaceous bordered with natal brown. Head mottled with various shades of brown with broad eye band of olive. Face sandy shading to wood brown on snout. Irregular light markings near eye and one wide golden band from eye down and back to jaw. Legs and tail buffy brown with mottlings of darker.

Female breeding: Black inter-orbital stripe edged with lighter. Vertebral stripe orange.

Male not breeding: Mottled grayish-olive above with broad vertebral stripe of yellow buff, bordered with black. Mottled white below. At death darkens, the back stripe be-

TEXT-FIG. 1. *Anolis chrysolepis*. Hyoid.

coming bright gold anteriorly, reddish-brown on tail.

Female breeding: General color smoke gray with fine black stippling. Snout lighter. Top of orbits bright yellow gray, with hour-glass transverse marking of dusky. Dorsal stripe olive buff, lighter on lower back and tail. This stripe narrows over the shoulders and widens on lower back. Sides of face buff mottled with brown. Limbs smoke gray mottled with black. Ventral surface vinaceous with dark mottling under limbs and tail. Iris apricot yellow with fine freckling.

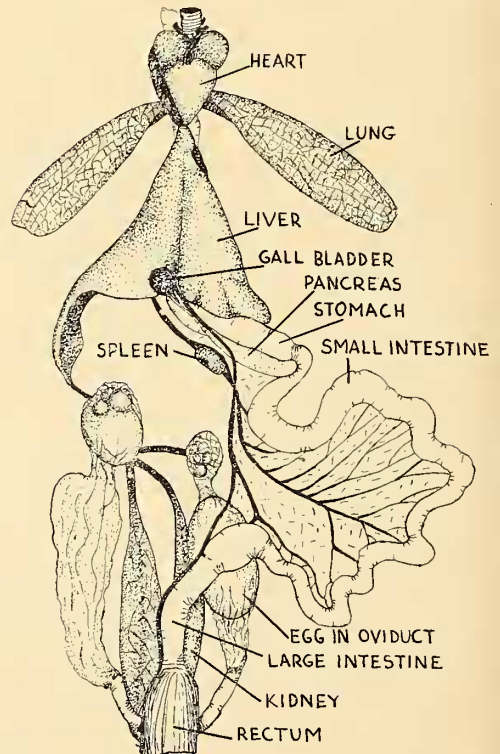
These six descriptions will give an idea of the infinite variation. Often an anouia will change so radically that a description cannot be finished, some characters vanishing or being complicated by others. The two main differentiations into dorsal striped and no dorsal striped is regardless of age or sex. In the preserved specimens, flank markings and the eye band often remain the most distinct.

In a series of delicate measurements it was found that within a week, the change in total length from the living or just dead to the same specimen preserved, was from 1 to 3 mm.

Hyoid: Coll. No. 30,083, Caripito, April 10, 1942, adult male, total length 210 mm. Text-fig. 1. The glossohyal is an extremely

attenuated, needle-like element, equal in diameter throughout, extending forward 3.5 mm. from the basihyals. The latter are rather unlike their usual arch-like shape, due to amalgamation with the hypohyals. These latter are distinguishable as short, thick, forward-directed shoulders, completely ossified with the basihyals. From the anterior tips of these shoulders arise the ceratohyals, externally and with no evidence of a socket, as slender as the glossohyals, 8.5 mm. in length and directed at an acute backward angle. Short, transparent, distal tips represent the remains of epihyals.

From the thickened, posterior shoulders of the basihypohyals spring the first ceratobranchials, their enlarged, rounded proximal caps fitting nicely into deep, almost quarter-circle, concave sockets. These elements consist of dense, osseous-like tissue and their decided curve in another plane gives, from the dorsal aspect, a false impression of a rather sharp angle at mid-length. They are the heaviest elements in the entire hyoidean complex, and support the usual short, distal vestiges of first epibranchials. The second epibranchials surpass in development even those in *Polychrus*, being twenty-five per cent. longer than the ceratohyals. They arise as posterior, ankylosed continuations of the basihyals, extending straight backward 12 mm., decreasing slightly in caliber.

TEXT-FIG. 2. *Anolis chrysolepis*. Gross anatomy.

Food: The food of the gold-striped anolis did not show much variation. In order of abundance eaten, the five major ingredients were termites, spiders, ants, roaches and grasshopper nymphs.

Breeding: As marked by courtship and the deposition of eggs the following months were noted in my journal: March (2 times), April (1), May (3), June (7) and August (2 times).

An average egg measures 7 by 13.5 mm., the largest one 8 by 16 mm. The average weight was 2.8 grams. Dissection showed that 2 eggs might be laid simultaneously, but usually the second was several days to a week behind the first in developmental stage. The shell of the egg was rough, with numerous longitudinal striations or furrows. If not kept away from nest débris the egg became densely coated with whatever it touched within the first half hour after being laid.

***Anolis fusco-auratus* D'Orbigny, 1837.**

Names: Plain Jungle Anolis, Lichen-colored Anolis, Tree Anolis, Clay-colored Anolis, Snub-nosed Anolis.

Range: Northern South America.

General Account: Next to *Anolis chrysolepis* and *nitens* this is the most abundant anolid at Kartabo. It is decidedly a tree, not a bush or ground, lizard and is almost always found on pale bark or that encrusted with light-hued lichens. This choice of habitat is very pronounced and observable day after day. The immediate reaction toward an intruder is for the lizard to scurry up the trunk, so it was often necessary to shoot the reptiles with fine shot in order to obtain them. I never saw one on the ground and only once away from a good-sized tree. Specimens No. 698 and 699 were captured among the topmost foliage of a ninety-foot tree within fifteen minutes after it had been cut down. The tree fell in an open secondary clearing, so it may be assumed that this pair of arboreal anolids was living at a great height.

Color in Life: In addition to emotional and illumination color changes there are general types of patterning, one pale buffy with many irregular elongate spots and blotches, the other darker with a series of small, dark, mid-dorsal, roundish spots. Females usually show the latter tendency, but I have seen males in full breeding condition with both patterns well developed. Also the dewlap may be dominantly yellow or with much of the central area bright scarlet.

Adult male, pale phase, No. 2823, total length 130 mm., Color Plates 728, 729, 730, May 8, 1924: General body color pale smoke gray. Head and neck blotched with lightish gray (the only color in Ridgway that approximates this is light mineral gray). Body

has scattered, broken, lateral streakings of red brown and a broken, very vague line across the orbits of hair brown. Eyelids light vinaceous, limbs tinged with russet. Dewlap amber yellow, lighter toward median line; scales of lower neck becoming russet vinaceous as they spread out over the dewlap. Ventral surface dull yellowish-white, pinkish under arms, immaculate except for the chin region which is marbled with light brownish. The body color shades to white on the posterior two-thirds of tail, which has ten wide bands of deep brown, separated by twice their length of ground color, and becoming blacker toward tail tip. Pupil rim brilliant gold, iris orange, flecked with gold.

The dark phase of the same individual has the whole body clouded with sepia, the limbs darkening to uniform brown.

Breeding male, dark phase, No. 248, total length 145 mm., Color Plate 285, December 31, 1920: General color olive buff, with dull red brown head markings and broad tail bands. Fourteen small, irregularly rounded dark spots down the back from nape to beyond posteriorly adpressed knee. Ventral surfaces whitish. Dewlap pale chalcedony yellow at top, white front and back with large rounded patch of bright coral pink in center, the lines of scales over its expanded surface conspicuously white. The dewlap is large, extending from the vertical of anterior orbit, back to the line of adpressed elbow.

Male, not breeding, dark phase, No. 542, total length 90 mm., April 18, 1922: General color buffy olive, sides of face, neck and body olive, faintly mottled with cream buff. Chin and throat pallid with sparse brown stippling, moderately developed dewlap white anteriorly, in general coral pink with tinge of cream in center. Median gular scales of dewlap white. Iris brilliant gold mottled with darker.

Adult male and female, Nos. 698 and 699, total lengths 134 and 135 mm., weights male 1.1, female 1.6 grams: Caught in fallen tree-top foliage, August 9, 1922. Both in dark phase, ground color grayish-olive, darker mottlings along mid-back, others on head and snout. Limbs and feet fuscous. Tail marked alternately with fuscous and olive. Extreme body changes range from dark gray to dull green. Throughout these changes the male is paler, especially on head and tail. This makes the dorsal marks and the caudal bands much more distinct. The most radical difference between the sexes is the dewlap, which is almost absent in the female, represented by only a self-colored, slight throat fold. In the male it is relatively enormous, 20 mm. long by 10 high, extending from below the anterior level of the eye to the mid-belly. Elsewhere the male is uniform in ventral coloring, white on chin and throat, buffy white on body and base of tail.

The female is white below, much marbled with dark brown along the line of the jaw and down the center of the body.

Breeding male, No. 2864, total length 117 mm., May 16, 1924: This anolis never lost its strong tinge of yellow green, evenly distributed from snout to tail tip.

Food: No. 248: 3 termites, 2 small grasshoppers; No. 542: 3 termites, 6 flies. Nos. 698 and 699: 14 termites, 7 flies, 2 stingless bees, 3 ants, 1 mantid and 4 salticid spiders.

Breeding: Breeding males were found on May 10 and 16, August 9 and December 31. A female taken on May 12 contained an egg about to be laid, measuring 5 by 10 mm., and another egg with well developed yolk which would have been ready in ten more days.

Anolis nitens (Wagler, 1830).

(Plate I, Figs. 3 and 4).

Names: Oblique-striped Anolis. Ho-kobee, Ey-a-moo-ru (Akawai Indian).

Range: Northeastern South America.

General Account: The most abundant anolis both at Kartabo and Caripito also exhibits the greatest variation in coloration but not in pattern. It is found in the jungle both on tree trunks and on low bushes, but usually on the latter.

Two general types of coloration are found, the lizards with dominant brown and honey yellow markings, and those with black, gray and white. The most persistent character is the pink rump which is almost invariably present both in the lightest and darkest phases and in both sexes. It vanishes very soon after death.

The most characteristic pattern is a series of posteriorly pointed V-shaped markings on the back from shoulder to beyond the base of the tail, accounting for my long-used field name of oblique-striped anolid. These alternating V's may be black, buff, honey yellow, gray or brown. The head is variously striped and banded with contrasting colors, and always with a large orange or white stripe from eye to ear, and alternating bands along the edge of the lower jaw. The limbs and tail are banded with more or less regularity and the under parts are pale yellow, light gray or white. The dewlap, when well developed, is invariably scarlet, with a whitish base and dark, widely spaced scales over the expanded surface.

There is little distinction in the relative size of the sexes. In 12 breeding males, all with perfect tails, and with extreme total lengths of 166 to 209 mm., the average was 186 mm. In six breeding females, measuring from 165 to 198, the average was 180 mm.

This anolis has more confidence in its protective coloring than any other species and it is not difficult to pick an individual from leaf or trunk. The hand must be moved very

slowly, and a more certain method is to wriggle the fingers of one hand in front of the lizard while the other approaches from above or behind. In neither case is there any chance of not being observed. The bright eyes of the anolis watch keenly, but in the divided interest the capture is more certain. It is remarkable how the lizard will watch the fingers actually close on its body without moving. The least jerk or quick motion will send the creature away in a lightning dart.

Food: The food of fifteen individual anolids was as follows: termites (occurring 12 times), grasshopper nymphs (10 times, all in April), beetles (5), ants (4), roaches (4), caterpillars (2), spiders (2), the anolid's own skin (2), mole cricket (1).

Breeding: I find records for only a portion of the year at Kartabo, for breeding of this species. This, of course, is only a part of the whole picture. April (13 records), May (9), June (5 records), July (2) and August (2 records).

An average egg measures 8 by 16 mm., and is rough in texture with numerous longitudinal striations. Usually a single one is deposited but in one female I found two eggs almost ready for laying, measuring respectively 13 and 14 mm. in length.

A full-grown female kept in a vivarium ate 114 termite workers in 11 days, and probably many more when I was not watching. When a choice of other food was offered, the termites were always taken first. After a two-day fast, the lizard ate a yellow and black hemipteron which would be called warningly colored. On five succeeding days eight other insects of the same species were refused on sight without any attempt at tasting. After another two days' fast she refused a very small *Dendrobates trivittatus* and when the juices of one of these frogs was rubbed on a grasshopper nymph the anolis rejected the grasshopper after taking it in her mouth.

Anolis punctatus Daudin, 1802.

Names: Blue-spotted Green Anolis, Large Pug-nosed Anolis.

Range: Northern South America.

General Account: This species seems rather rare, only three specimens being seen and taken at Kartabo and none at Caripito. One is No. 3129 (21293 in American Museum), Kartabo, 1919, total length 195 mm. The second, No. 3269, male, total length 250 mm., September 1, 1920. Both of these lizards were taken on leaves on the ground in the jungle.

Male adult, No. 3024, Kartabo, August 30, 1920, Color Plate 219:

Measurements: Length 220 mm., head 11 per cent. of length, body 39, tail 50, fore leg 15, hind leg 24 per cent., weight 7.4 grams.

Color in Life: This male is essentially

dark yellow green including all upper parts, head, body, limbs and toes, with a sparse scattering of small, irregularly rounded spots of pale turquoise blue, largest on the sides of body. The middle third of the tail is brilliant neva green, and the terminal third vandyke brown. Dorsal head scales are touched with bright chalcidony yellow and orange. Sides of head anteriorly green, scales below the eye shaded with primuline yellow; eyelids russet vinaceous with a double row of yellow scales around the eye. The dewlap is very large, beginning at the vertical in front of the eye and reaching back almost to mid-abdomen. Its depth is considerably more than from the posterior eye to tip of snout. It is distinctly but not brilliantly patterned and colored cadmium yellow, and when widely distended 10 or 12 rows of separate scales show as curved lines of white dashes, those in the central rows flanked with black at the bases.

Color Change and Habits: The blue-spotted anolis has considerable power of color change, and both dorsal and ventral greens, under stress of emotional excitement, become varying shades of russet and terracotta. When chloroformed it becomes in general brown with the pale spots turtle green, and below dull brownish. The dewlap remains unchanged except that it darkens in general. An hour after death, in two instances, the normal green colors of life returned until placed in preservative. In preservative this anolis turns black or dark wine color, all trace of the green and blue disappearing.

Unlike the more common anolids this seems unadapted to captivity and refuses to feed readily. In the first excrement pellet were the remains of two winged queens of *Cryptocercis atratus*. It was seen to feed on termites.

***Anolis sagrei* Cocteau, 1837.**

Range: Northern South America, north to Honduras; Cuba.

General Account: I have records of only five specimens taken at Kartabo, two of which (21272 and 38675) are in the American Museum.

Usually dark gray with a series of thin V-shaped lines down the back. These marks are sometimes more or less broken up into spots and blotches on a dull greenish background. This general color can shift to a reddish-brown.

A female, No. 193a, secured August 10, 1919, laid an egg a few minutes after being placed in a vivarium. I can find no further notes in my journal.

***Anolis schiedii* (Wiegmann, 1834).**

Name: Small Brown Anolis.

Range: Northern South America.

General Account: Only one specimen re-

corded from Kartabo. No. 3119, September 6, 1919. Length head and body 40 mm. (tail broken). In my field notes not distinguished from other anolids.

The type of *gibbiceps*, a synonym (named by Cope in 1864) was taken at Caracas, and measured 49 mm. from snout to vent. The color description given by Boulenger (Catalogue of Lizards British Museum, Vol. II, p. 52) is as follows:

"Coppery above, uniform; sometimes with darker spots, or a light vertebral line in the female; lower surfaces whitish with metallic gloss."

***Iguana iguana iguana* (Linnaeus, 1758).**

(Plate II, Figs. 5 and 6. Plate III, Figs. 7 and 8)

Names: Iguana. Kuana (Boviander). Why-ah-mah-kah (Akawai Indian, "one who lives in the bush").

Range: Northern South America with other forms in Central America and the West Indies.

General Account: The iguana is the largest and most generally distributed of the lizards in the two districts under consideration. It is a vegetarian, essentially arboreal and seldom seen on the ground. While it can be considered a green lizard, yet its frequent banding with brown and its power of both pattern and color change make it very difficult to describe in general.

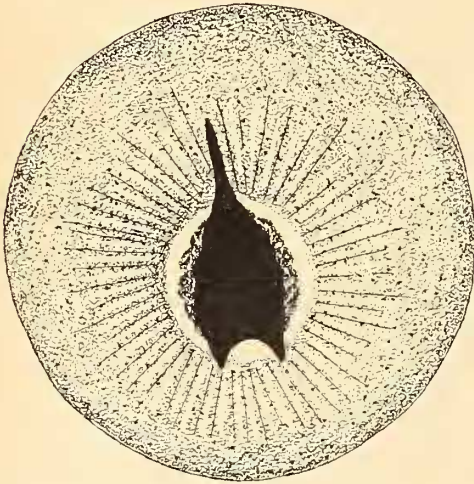
A typical individual is an adult female No. 2877, Kartabo, June 3, 1924, Color Plates 754 and 755:

Measurements: Total length 635 mm., head 6 per cent. of length, body 34, tail 60, fore leg 15.7, hind leg 24.5 per cent., weight 249 grams.

Color in Life: General color above grayish-olive with wide wash markings, generally pointing backward, of bluish-green with interspaces black variegated with small spots of light grayish-olive. A few of the lateral patches are vivid green and there are four very irregular, rectangular areas, edged posteriorly with black, of pale yellow green with dark stippling. The neck region has a black-edged cape of teagreen, fading to pale olive along its scalloped rear edge, which extends from the beginning of the vertical crest of spines on the nape, to a point a little back of the armpit. This cape is streaked and mottled with black and merges into the olive buff of the dewlap and the faintly bluish-green and pinkish scales of the head. The dewlap is marked with several almost vertical streaks of dark gray. Top of head strongly tinged with olive. A patch of black behind the orbit and one just below it, also a streak of blue green along the gape. The spines of the dewlap are buff, and there is a shade of wine color along the lower edge of this structure. The large cheek

scale is pale green with a patch of pink. Tympanum apricot yellow. Ventral surfaces pale green along the middle, olive buff on each side. Under limbs olive buff, mottled with darker. Fingers and three inner toes bright green. Limbs very dark brown with faint water markings of green, thickly sprinkled with olive. Iris cinnamon rufous tinged with dark brown and an inner gold ring.

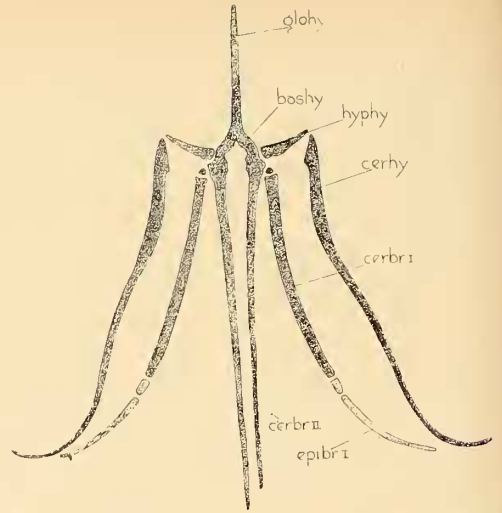
A young iguana of 200 mm. showed a simple pattern of general brilliant grass green above with five irregular bands of dark brown around the body and six around basal third of tail. The caudal rings shaded backward from deep green to pale blue green.



TEXT-FIG. 3. *Iguana iguana*. Fundus Oculi.

Fundus oculi: The eye of female No. 2877 was examined and described by Dr. Casey Wood and Mabel Satterlee on the day the lizard was caught, June 3, 1924, Text-fig. 3. Eyeground gray with darker stipples covering the entire fundus. The optic nerve is a rough circle almost entirely covered by the pecten. It is white and has white opaque nerve fibres radiating from it into the surrounding fundus. The pecten is dark brown, almost black. Its base is fairly circular with uneven edges, but the lower end is prolonged in two little swallow-tail points. It comes up into a high point which overhangs the optic at the upper edge for quite a distance. White opaque nerve fibres radiate from the papilla and there are dark brownish lines interspersed between them.

Hyoid: Coll. No. 3128, Kartabo, half-grown male, July 4, 1920, total length 635 mm., Text-fig. 4. The glossohyal extends forward as a slender rod, of equal diameter throughout its length of 8.2 mm. At its proximal end, it enlarges into the basihyals, which form an arch of only slightly greater



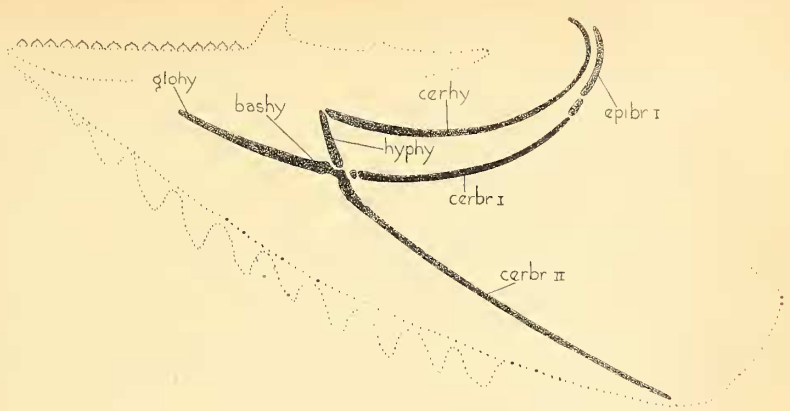
TEXT-FIG. 4. *Iguana iguana*. Dorsal view of Hyoid.

diameter, and which is given an artistic touch by two scallops, evident both on the outside and on the inside of the arch. Their practical use is apparent on the outside where these indentations act as sockets from which arise the proximal elements of the hyoid and the first branchial arches.

From the anterior facet spring the hypohyals, 3.3 mm., in length, ossified wedges, diminishing slightly in diameter and directed slightly anteriorly. From their tips, the very long, slender and somewhat curved ceratohyals extend backward at a sharp angle from the hypohyals, each 25 mm. in length. Although the tips are very attenuated and curved I can detect no differentiation into distal epihyals.

From the posterior, basihyal, concave sockets arise the pair of first ceratobranchials, each 15 mm. in length. The juncture is by a rounded hyaline cap within which is an ossified core. These elements are slightly greater in diameter than the ceratohyals, and are directed along a closely similar course. Continuing from the distal ends of the first ceratobranchials, are two consecutive elements, the first very short, 1 mm., and the end portion, 7.5 mm., long, slender and curved. If this condition was present in only one of the ceratobranchials, I should consider it an abnormal break, but it is identical in both. I believe the short intercalated rectangle is of the nature of a connecting element of use in providing increased mobility, and the longer, curved distal element as the first epibranchial.

The second ceratobranchial arises as posterior, undifferentiated extensions of the basihyal arms, well separated proximally, and only slightly nearer one another at their



TEXT-FIG. 5. *Iguana iguana*. Side view of Hyoid.

extremities. The left is 23.2 mm. long and its companion slightly shorter.

Hyoid, Side View: In the usual or dorsal view of a lizard hyoid the tips of the ceratohyals and the first ceratobranchials often cross one another, and the second ceratobranchials appear to extend straight back between the other elements on the same plane. To reorient this optical illusion of a flat plane point of view I have had the lateral view of the iguana's hyoid drawn. Text-fig. 5.

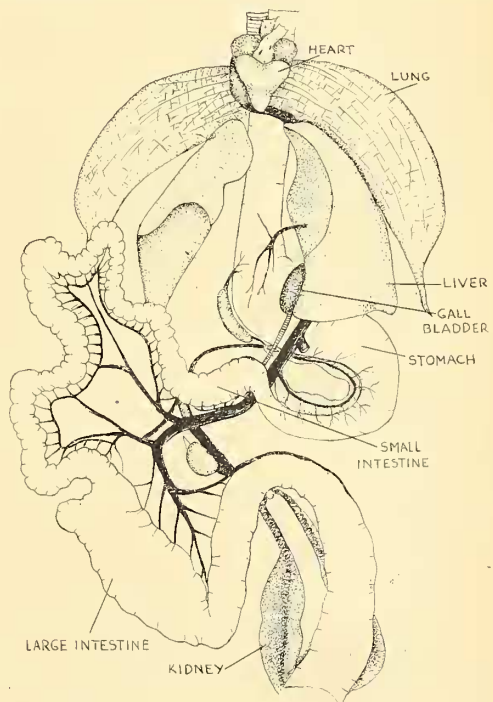
Here we have in dotted outline the toothed upper jaw, and a corresponding outline of the scale-denticulated dewlap or gular wattle. The glossohyal is seen to project forward in support of the tongue, the ceratohyals and first ceratobranchials curve up and around toward their former connection with the auditory meatus. The downward and backward directed second ceratobranchials play an important part in supporting the great throat dewlap. It is difficult, however, to understand how they can play an efficient part in the extension of the wattle, without simultaneously elevating the tongue. The apparent strong ossification suggested by the scarlet dye of the KOH is very evidently completely subordinate to the elasticity of the cartilage foundation.

Food: Two iguanas shot on March 24, 1919, 450 and 640 mm. in length, had the crops crammed with hundreds of small, unchewed leaves, packed tightly together like the leaves of a book, each leaf being about a half-inch across. The stomach was equally filled with the same material crushed and comminuted into a greenish pulp. Leaves and petals of flowers seem to be their chief diet, but they will eat pawpaws, jungle cherries and wild guava.

Enemies: On January 4, 1921, a small iguana, less than 300 mm. over all, was dropped almost at my feet by a swallow-tailed kite, *Elanoides forficatus yetapa*, as it swooped across the trail east of the Kartabo

laboratory. We have seen a jaguar in full pursuit of a large iguana.

Breeding: On September 26, 1922, four eggs were found buried under a bank, partly washed out by the rains. They corresponded exactly with ripe eggs taken from a female iguana. These eggs were one-third developed and showed an interesting disparity in shape and weight. One was round, the others elongated ovals. The shell was chalky white where not stained, rough, minutely and irregularly pitted. The size varied from 42 and 46 to 47.3 and 50.8, with an average of 44.5 by 49.4 mm. The weight extremes were 44.4 and 75.8, averaging 58.3 grams.



TEXT-FIG. 6. *Iguana iguana*. Gross anatomy.

Seven eggs were unearthed by a pet monkey at the foot of a dead stump on October 3, 1920. One egg was a small, round, runt, the rest were straight-sided ovals.

Habits: On February 24, 1942, five days after our arrival at Carpito, Venezuela, I noticed that a tall bare tree at the western edge of our compound had a single clump of buds looking like a small parasitic plant high up among the naked branches. We later learned that this tree, a relic of the cut jungle, was eighty-six feet high, and was a Yellow Puoi, *Tecoma serratifolia*. On March 3 the tree showed 17 widely scattered panicles of golden yellow bloom, besides scores of opening buds. On the eighth of the month I saw a four-foot iguana high up among the scanty flowers. From 6:30 A.M. to 1:30 P.M., at least, he remained motionless. The next day the lizard was in the same crotch at 7 in the morning and as far as I know had not moved at 5:45 P.M.

From March 11 on, the iguana was a permanent resident of the tree. An account of his activities on this one day will suffice for all others. He seemed to slumber soundly during the morning, although with my 40-power binoculars I could see his eyelids move now and then. At 11 o'clock he began to climb slowly up and about, and at 1 P.M. he was in the midst of the very topmost cluster of bloom, eating all he could reach and he could reach any he chose. His long tail hung down and he sometimes slipped on the slender bending twigs, and hung on with only the toes of one fore limb. The toes of all four have the power of locking tight about twigs which bend far down with his weight. At first he selected the full-blown flowers but later began on the buds. When sprawled out at the very apex of the tree, one hind leg would occasionally hang loosely, the other clinging with only the middle toe, as he edged slowly out toward the outermost flowers, although four or five other clusters were much nearer on stronger branches. He seemed to enjoy taking chances, and he never gave up. If a first attempt to reach a certain blossom failed, there followed another and another stretching of his neck, then out went his tongue, although it protruded hardly at all beyond his lips. At last he crept an inch nearer, the whole branch bending slowly far over, and when almost upside down he licked in the bud and swallowed it without chewing. On turning to descend he slipped twice and both times hung reversed by his hind toes alone. When he was able to keep his position by means of three feet, the toes of the fourth were used to hook and pull the twigs or panicle to his mouth. The tree was 150 feet from the laboratory porch and 86 feet high, yet the 20 or the 40 diameter binoculars showed every wrinkle of his scaly skin,

every tiny fly that alighted on the edge of his eyes.

On March 19, I noted that the iguana was back after three days' absence. In mid-morning he climbed up the tall bare trunk, and on to the very topmost branch and as all the blossoms were gone he devoured a precocious, long, slender, bean pod, the only one on the tree. It hung vertically over his head from the slenderest of twigs and his lips barely touched the end of it. The wind was blowing and as it swung back and forth he snapped at it and now and then bit off a short section. He never was able to secure more than a fraction. On April 11, the tenant of the Puoi again returned after a week's absence, spending the morning climbing about, plucking and eating the last blossoms of the season, even taking the small, green leaf buds as well. Again he showed his ability to cling by hanging with the toes of one hind foot, both fore feet engaged in pulling a branch toward him, while the other foot dangled in mid-air. On July 10, I noticed the great lizard asleep in a crotch among a mass of new green leaves, and I saw him for the last time on July 24. In the night of July 26, the great tree blew down and the iguana vanished forever.

Plica plica (Linnaeus, 1758).

(Plate III, Fig. 9).

Names: Spiny Tree Lizard. Agama (Creole). Ing-wallack (Akawai Indian).

Range: Northern South America.

General Account: A medium-sized, arboreal, insect-eating lizard. Found occasionally on rocks along the river, usually on bark of jungle trees. General characters, broad head and body, slight spiny crest on back and several spiny tufts on neck. Dark green above with wide dark bands mottled on body and solid on limbs and tail. Chin whitish, throat black and necklace black. Sides of head and under parts orange when in full color.

Male adult, No. 68, Kartabo, July 23, 1920:

Measurements: Total length 373 mm., head 10 per cent. of length, body 23, tail 66, fore leg 20, hind leg 30 per cent.

Color in Life: No. 68; Head yellowish-olive, deeper toward snout; back deep grape green, with seven wide mottled bands of black, the anterior one a collar, the posterior on the tail just back of the hind legs. The upper arms and legs similar in color and pattern, there being three mottled cross bands on the arm and four on the leg. On the lower part of the limbs, digits and tail, the bands become solid black and the green gradually pales to olive gray. There are six bands from elbow to tip of toes, eight from the knee down, and thirteen on the tail.

The black, mottled nuchal collar is mixed



TEXT - FIG. 7. *Plica plica*. Position on tree.

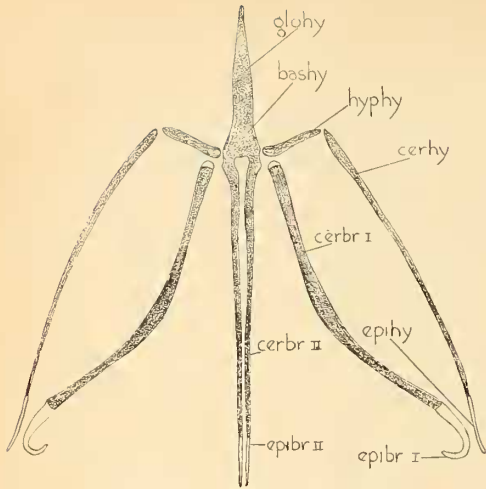
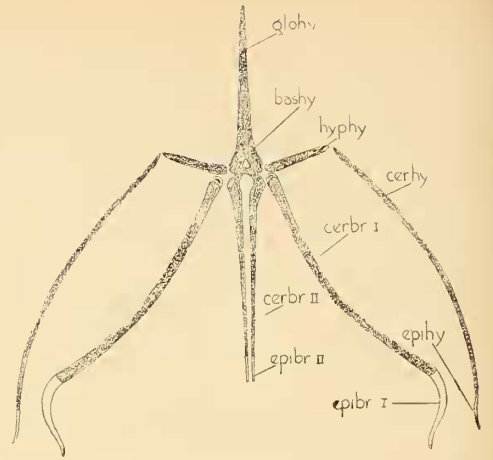
with smoke gray and changes abruptly on the side neck to black, which broadens out on the throat. Anteriorly this fades gradually through light olive gray to cartridge buff on the chin. Ventral surface: black throat narrowly bordered posteriorly with citron yellow, shading into apricot orange which covers the entire under body, thighs and ventral tail, paling to yellowish-white on distal limbs, soles and tip of tail.

Eyelid light grayish-vinaceous; pupil almost round with slight irregularity at bottom. Iris maize yellow, densely flecked with orange and gray, and a narrow inner ring of gold.

Arboreal Adaptations: Almost every scale has a sharp protruding spine and a sharp keel. Rubbed the wrong way on its soles, thighs, belly, chin or under tail it feels like

razor grass, and these projections must be of great help in sustaining its position on bark. The fingers are very long and the claws exceedingly long, sharp and bent downward. The exposed dorsal and throat patterns are highly protective, mottled dark and green. In its usual position, upside-down on trunk, the throat patch becomes a shadow and the head an irregular branch stub. The orange of head and sides are of slight conspicuousness.

A female about a foot in length was discovered by accident about 12 feet up on the trunk of a smooth-barked tree. She was in a most remarkable attitude, raised high so that no shadow was cast. I went on down the trail and two hours later, when I returned, the lizard had not moved a muscle. As seen from the sketch made on the spot

TEXT-FIG. 8. *Plica plica*. Hyoid of adult.TEXT-FIG. 9. *Plica plica*. Hyoid of newly-hatched lizard.

by my artist, it was head downward, with practically the entire weight supported by one hind leg, which, attached by two or three claws, was stretched out at full length. One front leg extended straight downward, and the other curved slightly upward. The dorsal crest and spiny neck tufts broke up the outline, while the mottled green color above made it the same color as the bark. It was by the merest chance that I discovered it. Text-fig. 7.

Hyoid: Coll. No. 3549, Kartabo, June 30, 1924, adult male, total length 325 mm. Text-fig. 8. Glossohyal rather short, relatively wide, like a narrow tongue in shape, 7 mm. in length. The mid section is very slightly wider than where it merges into the basi-hyals. These elements show very little lateral thickening, and only a slight, shallow cavity indicative of a lateral socket. From the upper part of this area arise the hypohyals, short, slender, 3.5 mm. in length, directed slightly forward. From their tips, with no evidence of specialized juncture, spring the long, very slender ceratohyals, 16.5 mm. in length, at a backward angle of 50 degrees. Transparent, short epihyals terminate these elements.

Below the origin of the hypohyals arise the stout, first ceratobranchials, with a flattened, proximal cartilaginous cap. In dorsal view, these bones bend sharply outward for a distance of 17 mm., terminating in curved, hyaline, first epibranchials. The arms of the basihyals are continued posteriorly by the long, slender second ceratobranchials. Proximally these bend inward toward each other, and maintain a closely parallel but quite separate course for their entire 15 mm. Typical short second epibranchials are at the extreme ends.

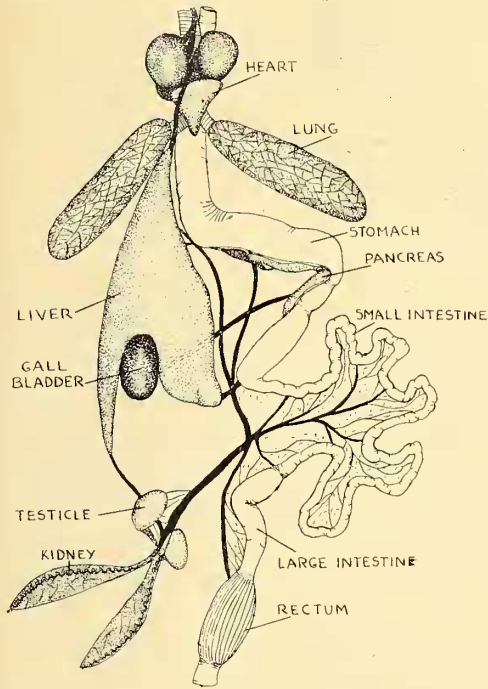
A young (24 hours old) *Plica plica*, Coll.

No. 870, Kartabo, April 25, 1919, total length 185 mm., shows distinct differences from the hyoid of the adult. Text-fig. 9. The relative lengths of the glosso- and hypohyals are the same, but there is relatively much less of antero-posterior development in the three elongated elements of the hyoid complex. The ceratohyals and first ceratobranchials in the young lizard present no change in their respective relative lengths, but the second ceratobranchials, instead of extending posteriorly an appreciable distance beyond the others, are hardly more than three-fourths of their length. This delayed ontogenetic development of an exceedingly primitive character, whose secondary function will be to assist in the operation of the very specialized wattle or dewlap, is significant and interesting.

The only other noticeable character peculiar to the juvenile lizard is a distinct thinning, almost a perforation, in the center of the basihyal mass or the base of the glossohyal. There is also a decided constriction of the proximal attachment of the second ceratobranchials into a neck. We can easily imagine that at a slightly earlier stage these elements would be pinched off altogether, thus isolating them and approximating a still more primitive condition.

Gross Anatomy: Adult male, Coll. No. 68, Kartabo, July 23, 1920, total length 373 mm. Text-fig. 10. The stomach is elongated, with the short, narrow duodenum turned right at an acute angle. The pancreas is narrow but long, extending along the duodenum and half way up the side of the stomach, partly overlying the long and narrow spleen. The small intestine is narrow and much convoluted, the folding recalling that of a young alligator. The cloaca is large and volum-

inous. The liver is shaped like an isosceles triangle. It is large and long, covering most of the intestines. It is deeply incised around the gall bladder, with a deep groove extending anteriorly for some distance. Measurements are as follows: small intestine 145 mm., large intestine 23.5, cloaca 23.5, duodenum 15, spleen 9, liver 48 mm., liver weight 1.1 gram. Weight of lizard, 76.7 grams.



TEXT-FIG. 10. *Plica plica*. Gross anatomy.

Food: The contents of six stomachs were (1) five beetle grubs; (2) large millipede, cicada, many red and black ants; (3) solid mass of more than 100 ants; (4) 85 termites, few winged ants, small scorpion; (5) large black bee; (6) bee, 40 *Atta* ants, several beetles, large roach and a spider.

In captivity these lizards accepted almost any kind of insect, including butterflies and moths of many species. With my large binoculars I was watching a *Plica* thirty feet up a tree when a cicada which attempted to alight on the lizard was seized like a flash and eaten. In Caripito I saw three of these lizards high up in tall jungle trees, all of them on the bark, and all quietly waiting upsidedown.

Breeding: A female taken May 13, 1924, contained two eggs, soft, but well developed, and soon to be laid. On May 24 of the same year a male was shot in full breeding condition.

Plica umbra (Linnaeus, 1758).

(Plate III, Fig. 10. Plate V, Fig. 14).

Name: Smooth-necked Tree Lizard.

Range: Northern South America.

General Account: At a distance, the chief difference between adults of *plica* and *umbra* is the black dewlap and, when closer, the presence of the spiny neck tufts in the former. *P. umbra* lacks both of these. In habitat, usual position on tree trunks, general reactions, and diet, the two species are indistinguishable. The head is short and broad, eye ridge prominent, color above in general olive with darker bands and mottlings; greenish-white or yellowish below. If we concede the power of concealment is equal and the chances of discovery the same, then *umbra* is about three times as abundant, judging by the number seen or collected. The relative number of young individuals observed is very much greater in *umbra* than in the other species.

Male adult, No. 14, Kartabo, April 23, 1919:

Measurements: Total length 256 mm., head 7 per cent. in length, body 24, tail 69, fore leg 16, hind leg 24 per cent. Weight 12.2 grams. The weights of male lizards varied from 10 grams for a 203 mm., specimen to 22.5 grams for one of 300 mm.

Color in Life: The principal pattern and color variations are covered by the following four descriptions.

Specimen No. 14, male: Upper surfaces and sides generally pea-green, becoming more yellow and changing to light yellow drab on the tail. Everywhere irregularly blotched with black, the black spots coalescing more and more as they approach the hind limbs, and finally on the tail becoming large spots of sepia. Upper arms and legs irregularly spotted with blackish-brown, much more concentrated on the tibia and fore arms, forming bars. At the articulations of the fingers and toes a spot of sepia. Upper and lower labials, head below a line from the nostrils over the canthus and eye to the tympanum, irregularly spotted and mottled with various shades of green, light greenish-yellow predominating. Lower surface of head, body, arms and legs pale pinkish-buff, changing to apricot yellow on tail. A decided orange cast between the two longitudinal folds of the gular region.

Specimen No. 14a, male breeding, July 27, 1920, total length 284 mm.: General color of back absinthine green becoming more intense on shoulders and dull lime green on limbs and tail. Scales of head and face a mixture of brilliant and pale grenadine pink, mottled with gray and green. Pineal scale lime green with gray central dot. Small dusky spot on back of neck. Five backward-pointing, transverse dorsal bands, the first deep black with central portion of dragon's



TEXT-FIG. 11. *Polychrus marmoratus*. Posture in tree.

blood red, connected laterally with the second which shows less intense black and more red. Last three bands paler red, with black framing before and behind, the sides of the bands breaking more and more into various sized black spots. Beginning at the thighs, 17 dull black bands extend to tip of tail, the bands being twice the width of the interspaces. Limbs and feet banded like the tail.

Specimen No. 808, male breeding, September 29, 1922, total length 300 mm.: Above, head blue green, body and limbs pale jade green. Broad, black irregular bandings, six across body, two on upper and two on lower arms and legs, and 15 on tail. The color on the tail changes gradually to citrine brown. Below head and jaws tea green, shading centrally into old gold; body and limbs smoke gray. An unusual character is four marks of strong yellow ochre around vent, forming three, narrow, tall triangles pointing forward along abdomen and outward along thighs; and a central spot directly in front of the vent. The dewlap, usually hidden, is lemon yellow.

Specimen No. 2661, female, March 24, 1924, total length 280 mm.: Top of head and neck gray. A short crest of cream and black pointed scales running from above tympanum to mid-body. Face and all labials bluish-

glaucous with patches of straw yellow in front of typanum each side of eye. Side of neck straw yellow, clouded with gray. Gular pouch light ochraceous buff becoming darker on chin and with a patch of red between humeral and gular folds. A broad band of black obliquely across shoulder. Upper body and limbs forest green with eight transverse bands of mottled brown and black, others on upper limbs. Body color changes to red brown on tail, brown at tip, which has nine mottled spots of black. General ventral color vinaceous fawn, deeper around vent and brown under tail. Iris dark speckled golden, with clear inner pupil ring.

Food: Four stomach contents were as follows: (1) 8 beetles, 2 ants, 1 katydid; (2) 27 large black ants, 3 small beetles, 4 small centipedes; (3) numerous black ants and beetles, 6 centipedes; (4) 2 June beetles, 30 small black ants.

Breeding: A male and female lizard (No. 191a) were taken while mating on September 9, 1919. Other lizards in full breeding condition were collected in April (3 records), May (3) and October (2). Surprisingly small lizards, less than 220 mm., both male and female, were found to be breeding.

A female, No. 216, October 14, 1920, kept in captivity for several weeks, laid two oblong eggs, 10 by 20 mm., white, with



TEXT-FIG. 12. *Polychrus marmoratus*. Posture in tree.

equally rounded ends, the surface rough, with many irregularities tending in a transverse direction.

Courtship: Several times we saw the violent bobbing of the head, the lizard standing upsidedown on a trunk, stretched high on its fore legs, always in the presence of another individual. In the case of the pair shot while mating, both sexes bobbed when first observed. This mated pair were distinguished by the following characters: Male, total length 290 mm., weight 17.7 grams. In general mottled dark green above, with dark bluish head, and much yellow buff about the vent and thighs. Female, total length 246 mm., weight 15.7 grams. Dull olive green above with greenish head and no yellow buff. All dorsal colors subdued and so merged that no specific description is possible; exactly like the mottled, lichened tree trunk to which she clung.

Polychrus marmoratus marmoratus
(Linnaeus, 1758).

(Plate IV, Figs. 11-13.
Plate V, Figs. 15 and 16).

Names: Many-colored Tree Lizard; Marbled Lizard. Gamma or Colonial Chameleon (Guiana Creole). Ee-wang-quee-buh-nah (Akawai Indian meaning, "Hungry father").

Range: Northeastern South America.

Occurrence: Both at Kartabo and Caripito this species is fairly common and probably might be called abundant if our eyes were keen enough to detect more than a small percentage of those clinging motionless and simulating their backgrounds on the branches of bushes and moderately tall trees.

Color in Life, General: This lizard defies any exact description as to pattern or color. The most usual appearance is of a large,

slender, green saurian with two jet black lines radiating back from the eye, one over the ear, and one to the gape. Usually there is a wide whitish band along the side and a brownish cast to the tail. The entire lizard can become wholly green or altogether brown, and often the back develops a series of five or six broad, oblique, straw yellow bands separated by darker bands. The under parts may be immaculate white, or mottled and marbled with green or brown.

The markings of the dewlap are varied, often being very obscure, or occasionally flaring as several longitudinal scarlet slashes. The iris shares in this variability. Of three full-grown lizards one had the eye golden-brown marked with silver; a second deep wine color with inner ring of gold, and a third showed the upper quarter warm buff and the rest tawny.

The males are smaller than the females, the average total lengths of nine males being 385 mm. and of 13 females 478 mm. Part of this extra length is taken up by extra body length in the females, as the tails of the males average 72 per cent. of the total length as compared with 68 per cent. in the females. The largest female I have measured was 506 mm.

The weights varied considerably, being greater of course in breeding females. Extremes in adults of both sexes were 18.6 and 36 grams.

The femoral pores varied from nine to fourteen, sometimes in the same individual. Of 12 males, two were symmetrical, in one the left leg had the larger number while in the remaining 10 there were more femoral pores on the right than on the left thigh.

Color in Life: No. 637, Kartabo, May 14, 1919, total length 330 mm., although small was fully adult. It permitted a close approach and was colored as follows: lumiere green on head, sides and under parts of the body, darkening to forest green on the dorsal surface of back and limbs. Labials, chin and throat pale lumiere green. A few irregular and indistinct cephalic, dorsal and femoral spots of vinaceous brown, and the entire tail, beginning abruptly at the vent, of this color, with about sixteen nodes of lighter bands bordered with darker. A broad irregular band opalescent white from shoulder back along sides, breaking into irregular spots on the outer border of femur and ulna. The most conspicuous marks are the two lateral head lines of black which I have mentioned. A third almost as distinct extends directly downward across the upper and lower lips, while four other broken ones radiate upward to the supraoculars, each ending in a distinct black spot.

No. 185, female, August 16, 1920, 452 mm. in length, was of a general vinaceous brown over all the dorsal parts, and fawn

color below. This color held after death. Another female was also brown in general with the dorsal oblique bands well developed. This pattern also held after death and in the flat mounted skin, twenty-five years after capture, the pattern and colors are distinct as ever.

Change of Color: September 14, 1917, caught a male *Polychrus* 432 mm. in length. It was green in general but after five minutes in a vivarium it turned almost uniform clove brown above, with abdomen and broad tail bands light pinkish wood brown. Faint traces of green remained around the eye and ear, and a large round patch on the left side, just in front of the insertion of the fore leg, remained brilliant green. The change to this sombre color occurred within thirty seconds. After fifteen minutes the green color began to reappear. One week later when put in preservative, the green color returned in full strength, turning at once to an abnormal blue.

Habits: *Polychrus*, more than any other lizard I know, depends on two factors of safety, change of color to approximate the immediate surroundings, and most remarkable strained and posed attitudes which are maintained for considerable lengths of time.

An example is specimen No. 637 caught on a low branch on the edge of the jungle near the Kartabo laboratory. It was hugging the end of a brown branch which was covered with a mottling of lichens of almost the same color and pattern as its body. Its tail hung loosely outward exactly like a side twig of the branch, and as I approached it only gripped more tightly. At last it raised itself on its fore legs, distended its dewlap as wide as possible, and then rushed through a tuft of leaves for a few inches, and again clutched the branch, allowing the right fore leg and the left hind leg to dangle free. It now changed to a dominant green and before my eyes melted into its new environment, wholly unlike the brown previous color. I seized it with a sudden, swift motion, when it opened its mouth and did its best to bite me. A moment later it succeeded and the sharp teeth and jaw muscles gave force enough to make several deep tears in the skin. The claws of this lizard are long, sharp and curved and exceedingly uncomfortable when tightly gripping one's hand.

Several times when by accident we spied one of these lizards near the laboratory I took the artist out and had a sketch made direct from the position. In one case the lizard kept the pose for more than three hours, although it looked most strained and uncomfortable. Two of these may be seen in Text-figures 11 and 12. In the first, the lizard is twisted around a small branch,

gripping with one hind leg and its thigh. The left hind leg has two claw holds and two more on the left fore leg. The right fore leg is wide spread in mid-air and the tail is curved in a horseshoe shape in defiance of the pull of gravitation. In the second, the body is vertical between two separated branches, the whole weight resting on the right hind leg, the only other contact being through three toes of the left fore leg and one of the widely extended left hind leg. The right fore leg is extended in mid-air and the tail is curved in an S-shape out away from the branches. Only by sheer accident are these good-sized lizards ever detected, at least by human eyes, and it is reasonable to suppose that somewhat the same difficulty attends the endeavors of enemies.

Food: *Polychrus* is omnivorous. The contents of six stomachs were: (1) green katydid; (2) large green cetonina beetle; (3) several green-fleshed berries, insect remains; (4) roach and grasshopper; (5) large grasshopper, two moths; (6) three beetles, four winged ants, cicada, six seeds.

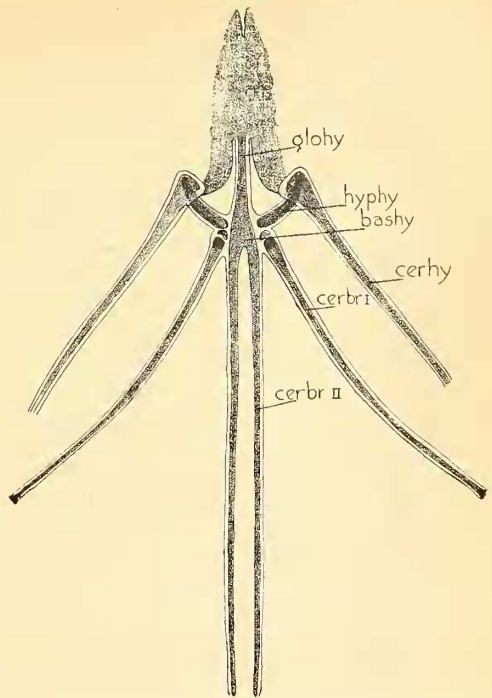
Breeding: Lizards in full breeding condition were found in January (1), July (3), and August (2). Closely associated pairs were seen well up in high bushes in June and July. In breeding males the testes were from 8 to 9 mm. in length.

No. 210, Kartabo, female, January 1, 1921, length 372 mm., laid three eggs in a vivarium seven days after capture and then died. Dissection showed four more eggs fully shelled and quite ready to follow the first three. During this entire time the lizard remained an almost solid brown, in spite of the fact that the cage was well filled with green leaved plants. The seven eggs averaged 11.7 by 26.2 mm. in size and in weight 1.9 grams. They were long, even-ended ovals or very slightly curved, hinting of a kidney shape. The shell was hard, deeply and longitudinally rugose or furrowed.

A female taken August 13, 1922, contained eight eggs one-third developed, three in the right ovary 3 mm., in length, and four in the left ovary, all 4 mm. in length.

Enemies: On August 26, 1922, I took a slightly damaged *Polychrus* from the stomach of a white-collared hawk, *Leucopternis albicollis albicollis*. This hawk hunts in deep jungle, often rather low down, and would be one of the few dangers to which this lizard is exposed.

Hyoid: Female adult, length 330 mm., Cat. No. 637, KOH No. 2021, May 14, 1919. Text-fig. 13. The glossohyal extends forward as a stout rod entering a lingual core so dense that the rod is lost and does not appear again. This tongue-shaped lingual core is split anteriorly, and behind it sends back two lateral cornua. It frays out into



TEXT-FIG. 13. *Polychrus marmoratus*. Hyoid.

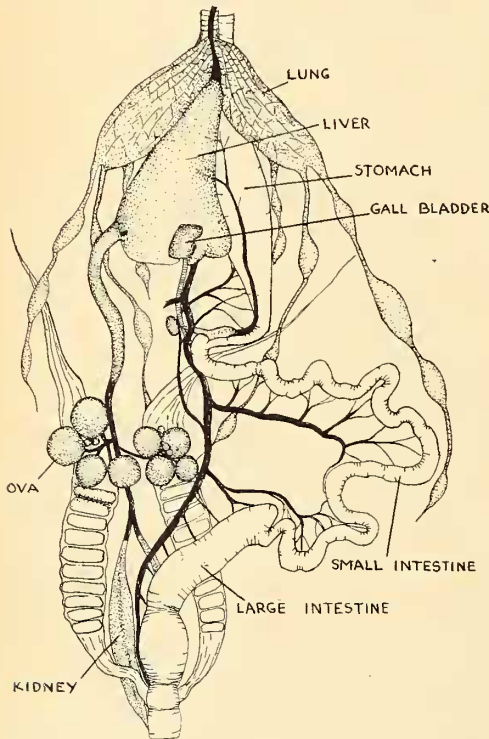
the tongue tissue, and occupies about half the area of that organ. Posteriorly the glossohyal widens slightly into the head of the basihyals which afford attachment to the two anterior arches, and which bifurcate immediately behind.

From the slight head of the basihyals two important elements arise, the hyoid and the first branchial arches. The hypohyals are short, rather thick and strongly curved, thus presenting a suitable surface for the support of the posterior lateral branches of the tongue. Their proximal ends approach closely to the basihyal body, just at the shoulder above the forks, and they curve out and forward. Their distal ends are rounded and lie above the broad ends of the ceratohyals, quite unattached except by tissue which permits the two elements to move rather freely upon each other. The ceratohyals are long and straight, and extend obliquely backward at right angles to the hypohyals, beneath whose ends they arise. Their proximal ends are wide and flat, almost scapular in shape, while distally they terminate in a curved hyaline tip, all that is left of epihyals.

Returning to the shoulder of the basihyals, the first ceratobranchials arise in close association with the other two elements, united to them by hyaline cartilage. They have a well-developed, dense, hemispherical cap, which may be the last evi-

dence of hypobranchials. The ceratobranchials curve gradually outward and are slender, narrow rods, ending in a moderate, curved, hyaline, pointed tip of epibranchial derivation, which curves around in close proximity to the tips of the hyoid arch.

The second ceratobranchials are extremely elongated, parallel and very close together, being surrounded by a hyaline envelope, and joined together by a delicate membrane. The tips end in a transparent spatulate enlargement. Proximally, no distinction is visible between the ends of the basihyals and the beginnings of these second ceratobranchials. *Measurements*: Lingual core length 7.7 mm., visible glossohyal rod 4.8, hypohyals 3, ceratohyals 13.7, first ceratobranchials 15.4, second ceratobranchials 18.6 mm.



TEXT-FIG. 14. *Polychrus marmoratus*. Gross anatomy.

Gross Anatomy: No. 185, Kartabo, female, August 16, 1920, length 452 mm., nostril to anus 124 mm., weight 37 grams. Small intestine 117 mm., rectum 23, cloaca 16 mm., liver weight .8 gram. Text-fig. 14. The body walls of the abdomen are lined with a blackish membrane. Each lung sends down three long, narrow, noded tentacles which may be inflated, and which pass between the folds of the intestine, around the

ovaries and down to the kidneys. The lower portion of the stomach is curved to the right. Each ovary contains four large eggs with yolk almost of full size. There are a few very small ova.

The large epigastric vein enters the larger portal vein some distance below the liver; the mesenteric enters it more posteriorly, as does the splenic. The portal passes over the pancreas and under the duodenum, being attached to the walls of the intestine, after the mesenteric has entered it. Arising from the cloaca, it passes forward to meet the mesenteric, being joined by branches from the rectum and a large vein from the lower portion of the small intestine. A system of veins drains from the stomach into the splenic and thence into the portal. Several gastric veins run directly into the left lobe of the liver from the stomach. The spleen is small and bean-shaped.

Tropidurus torquatus hispidus (Spix, 1825).

(Plate VI, Fig. 19).

Name: Spotted Tree Lizard.

Range: Northern South America.

General Account: A rare lizard at Kartabo and not recorded from Caripito. Only four specimens taken of which two are lost. At a distance probably confused with young *Plica*.

Measurements: Adult male, No. 306, April 25, 1919, length 175 mm., head 8 per cent. of length, body 24, tail 68, fore leg 16, hind leg 25 per cent.

Juvenile male, No. 2768, April 21, 1924, Color Plate 706, length 127 mm., head 8.6 per cent. of length, body 28, tail 63.4 per cent.

Color in Life: No. 306, olive brown above marked with black. Anteriorly these markings are in the form of vertical bands, three passing through the eyelids, followed by eleven from the nape to the mid-back. When the fore limb is adpressed to the body the 5, 6, 7 and 8th bands are continued across the upper arm. The posterior back and the tail are unmarked. Under parts from chin to vent bright salmon. Sides of chin and throat marked with broken lines, with a very heavy converging broken band on the mid-throat and side fore shoulder. Two transverse broken bands extend across the ventral fore body, and the lower sides of the body are rather finely spotted.

The dorsal crest is well marked, starting on the nape and ending abruptly half way down the tail, although this member is not regenerated. The crest is low and even, as far as the sacral region where it doubles its height and maintains this to the posterior end.

In the juvenile specimen, No. 2768, the

upper surface is bluish-gray, the occipital plate black, with a wide, conspicuous backward-pointing V of creamy white. Dorsal crest with wide spaced bands of black. Four narrow black lines radiate from the eyelids, forward, down and back. Five additional, oblique broken black bands are visible between the nape and shoulder, the posterior one a strong, solid streak in front of the insertion of the fore arm.

Adult female breeding, No. 306a, length 141 mm., is dark above, paler below, spotted and mottled coarsely on chin and throat, back to mid-body.

Breeding: Specimen No. 306a contained two eggs about to be laid, apparently full-sized, measuring 10 by 15 mm., one on each side of the body.

***Uranoscodon superciliosa* (Linnaeus, 1758).**

(Plate VI, Figs. 17 and 18).

Name: Gray, or Brown Tree Lizard. Agama (Creole). Yamu-koo-roo (Akawai Indian, "crossing over water, because he swims creeks and makes bubbling noises when swimming").

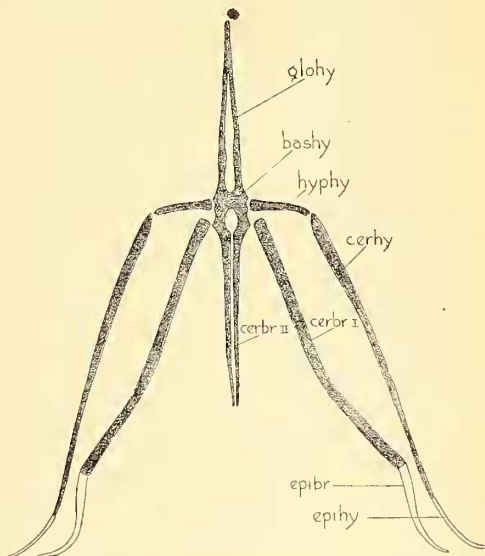
Range: Northeastern South America.

General Account: These lizards are not uncommon, both at Kartabo and Caripito, but are doubtless more often overlooked than discovered. They are among the dullest of monochrome saurians with habits directly correlated with their pigmentation. They live chiefly in dense jungle, but are also found on rank growths along the shores of creeks and rivers. Most of the day is spent in clinging close to a twig or branch as brown as they are, and only by accident did we ever locate them. They never try to escape, but allow themselves to be picked off, legs dangling in mid-air, eyes half open, making no effort to escape or bite. They may be hung on a sleeve and carried back to the laboratory with no concern about their moving. I have put one on a branch in a vivarium and had it remain without movement for 38 hours, although the eyes were open, and the lizard seemed fully conscious of what went on around him. When the gray lizard does move it is with a headlong rush. On level ground I have seen them more than once work up to bipedal locomotion for a few yards. They are gentle and never make any attempt to bite.

Measurements: In lizards of 226 to 400 mm. total length, the measurements show little variation. The average is, head 7 per cent. in length, body 23, and tail 70 per cent. Weights, length 150 mm. (3.4 grams), 226 (10), 320 mm. (20 grams).

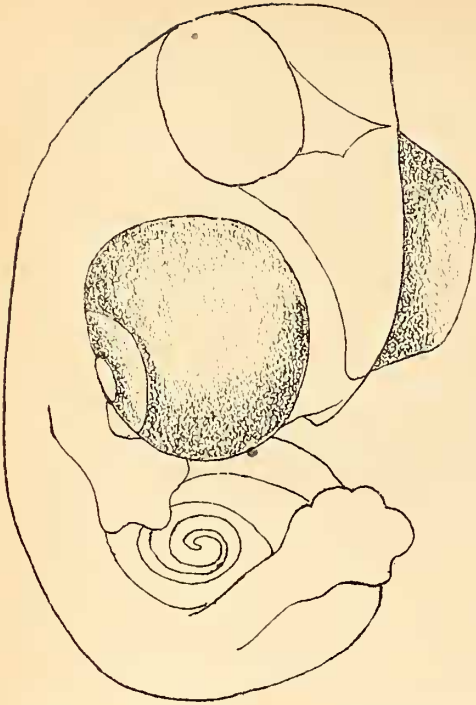
Color in Life: Male, No. 810, Kartabo, length 400 mm., September 30, 1922: General color above grayish-brown mottled faintly with spots of buff which are scat-

tered along the side of the head and dorsal crest, and in six large, irregular groupings along the side of the body. Inner edge of eyelids, throat and slight dewlap, and an elongated patch of mottling along ventral surface colonial buffy yellow. Limbs strongly banded with darker color. Whitish-brown below. Iris orange rufous flecked with gold and darker on outer edge. Narrow inner iris rim yellow. In very young lizards there are several pale buffy white lines radiating downward and forward from the eyes across the snout and jaws. A broad whitish band begins back of the eyes and curves over the shoulder and widens into a festooned band along the sides of the body and tail, edged above with black freckling.



TEXT-FIG. 15. *Uranoscodon superciliosa*. Hyoid.

Hyoid: Coll. No. 3006, Kartabo, August 19, 1922, total length 240 mm. Text-fig. 15. The glossohyal is 5 mm. in length, wide at the base and gradually narrowing to the anterior tip. The basal two-thirds of its length is perforated by a longitudinal aperture, so wide that the lateral osseous boundaries are as narrow as the beginning of the solid distal third. The basihyals show little lateral thickening, but present two distinct although shallow sockets on the external lateral aspect. From the upper one arise the hypohyals, fairly heavy, 2 mm. long and extending at right angles to their point of origin. Equally slender ceratohyals arise from their tips, and extend obliquely backward for a distance of 9.5 mm., giving rise, in turn, to long, slender epihyals. The first ceratobranchials originate at the lower socket of the basihyals, and are considerably heavier than the ceratohyals, and 8.2 mm.



TEXT-FIG. 16. *Uranoscodon superciliosa*.
Embryo.

in length. The terminal first epibranchials are longer and thicker than the epiphyals. The central foramen in the body of the basi-hyals is a good-sized oval, and the lateral arms are continuous and fused with the posteriorly directed second ceratobranchials, which extend straight backward for 5 mm.,

separated from each other by a narrow, clear channel. No signs of second epibranchials are visible.

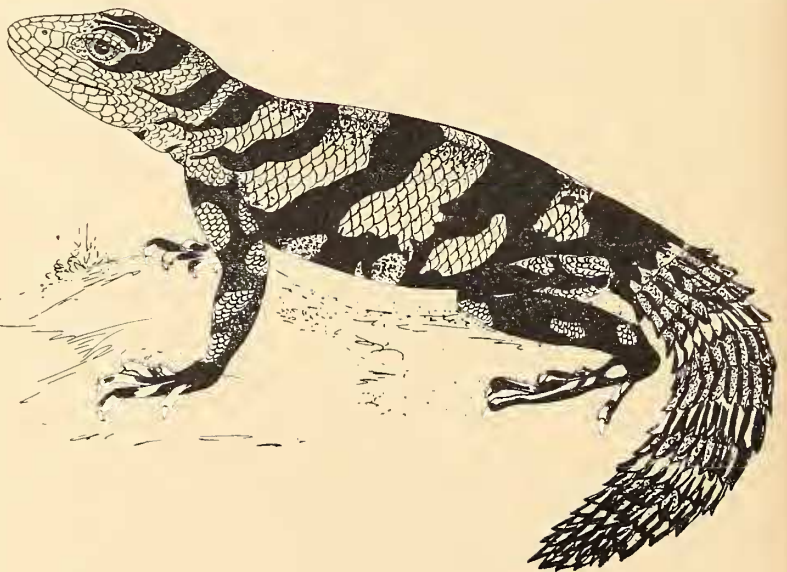
In the perforation of the glossohyal and the relative shortness of the second ceratobranchials the hyoid of this two-thirds grown *Uranoscodon* bears a striking resemblance to that of a half-grown *Plica plica*.

Food: In captivity one gray lizard lived for a month and a half voluntarily without food, although surrounded and in the midst of plenty. There was little evidence of emaciation. When at last the prolonged fast was broken, the lizard readily devoured quantities of orthoptera, caterpillars and grubs, but showed little relish for termites. A young male taken August 19, 1922, had eaten a millipede and three lepidopterous larvae.

Breeding: On August 5, 1920, three miles out along the Puruni Trail, Kartabo, Dr. William Morton Wheeler called to me to come and see a large *Uranoscodon* on her nest. She was in a hollow in a half-broken knot-hole of a decayed log, and had deposited 11 eggs. Unlike the usual reaction of this species she was nervous and timid, and at our close approach she rushed out and up the nearest tree trunk. I stunned her with a bullet on the bark beneath her and put her in a snake bag. She was No. 312, August 5, 1920, length 405 mm., weight 26 grams, Color Plate 216.

The hollow bore evidence of considerable scraping, as if enlarged by the lizard. Remains of old bits of shell of the same character as those freshly deposited hinted at a former occupancy. One egg, accidentally broken, was perfectly fresh.

The 10 remaining eggs weighed 24.4



TEXT-FIG. 17. *Urocentron azureum*.
Drawing of adult.

grams, averaging 2.4 grams. The average size was 13.4 by 24.3 mm. The shape was rather variable, one end slightly smaller than the other, three noticeably wider across the middle, the rest with sides parallel. The shell was leathery, rather soft, roughened, with low striae extending transversely around the shell. The shells were already brownish, stained from contact with the soil, but they washed to a dull white.

Sixteen days later the embryo was well developed, limb pads entire. Text-fig. 16. At 30 days the embryo measured 33.5 mm., with other percentages as follows: head 19 per cent., body 35, tail 46, eye diameter 12, arm bud 10, leg bud 14 per cent. Either from lack of moisture or other cause the eggs failed to hatch.

On August 22, 1922, six eggs of this species were brought in by our Indian hunter, taken from a hollow 12 feet up a tree. The eggs averaged 13.6 by 25 mm., and in weight 2.7 grams.

Urocentron azureum (Linnaeus, 1758).

Names: Spine-tailed Lizard. Tali-tali (Akawai Indian).

Range: Brazil and the Guianas.

General Account: Two specimens were taken at Kartabo, both of which have disappeared. Specimen No. 41 was found by me among some rocks near the shore at Kartabo, on April 28, 1919. It was 100 mm. in length. Color Plate 35. Identification from the color plate seems certain. Text-fig. 17.

A second specimen was brought in by my collector in 1922, and either escaped before being killed or was lost in transit.

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EXPLANATION OF THE PLATES.

PLATE I.

- FIG. 1. *Anolis chysolepis*, breeding male, Spec. 2778. $\times 3$. Upper parts brown and gray, dewlap scarlet.
- FIG. 2. *Anolis fusco-auratus*. $\times 2$. Pale green with gray markings.
- FIG. 3. *Anolis nitens*, Spec. 530. $\times 2$. Light brownish-yellow marked with dark brown, dewlap scarlet.
- FIG. 4. *Anolis nitens* (right) and *Anolis chysolepis* (left). Photograph from life. Natural size.

PLATE II.

- FIG. 5. *Iguana iguana* on branch. $\times \frac{1}{2}$.
- FIG. 6. Head of adult *Iguana*. Natural size.

PLATE III.

- FIG. 7. *Iguana iguana* half-grown, Spec. 2877. $\times 2$. Head and dewlap gray, marked with olive green on body and legs; feet green.
- FIG. 8. Seven eggs of *Iguana*. $\times \frac{1}{3}$.
- FIG. 9. *Plica plica*, Spec. 2844. Natural size. Face and upper labials orange, dewlap pale brown and black; body pale blue and green marked with black; legs and toes black banded with lemon yellow.
- FIG. 10. *Plica umbra*. $\times 1\frac{1}{3}$. Side of face and labials pale blue, top of head gray, dewlap golden yellow, body and legs green marked with black.

PLATE IV.

- FIG. 11. *Polychrus marmoratus*, Caripito. $\times \frac{1}{3}$. Head, body and legs bright green, dotted with gold; belly and tail gray marked with brown.
- FIG. 12. *Polychrus marmoratus*, Caripito. Head, natural size, green marked with black, dewlap green with scarlet streaks.
- FIG. 13. *Polychrus marmoratus*, Spec. 3544 Female. $\times \frac{1}{2}$. Flat skin, brown phase, light golden brown marked with dark brown.

PLATE V.

- FIG. 14. *Plica umbra*. $\times \frac{1}{2}$. Female with eggs.
- FIG. 15. *Polychrus marmoratus* in jungle. $\times \frac{1}{4}$.
- FIG. 16. *Polychrus marmoratus*. Seven eggs. Natural size.

PLATE VI.

- FIG. 17. *Uranoscodon superciliosa*, Spec. 515. Half-grown. $\times 1\frac{1}{2}$.
- FIG. 18. *Uranoscodon superciliosa*, Spec. 312. $\times 1\frac{1}{2}$.
- FIG. 19. *Tropidurus torquatus hispidus*, Spec. 306. $\times 2$. Head, body and upper sides of legs olive green, supraocular scales and all under parts bright pink marked with black.